Dental Use and Expenditures for Older Uninsured Americans: The Simulated Impact of Expanded Coverage

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Objective. To determine if providing dental insurance to older Americans would close the current gaps in dental use and expenditure between insured and uninsured older Americans.

Data Sources/Study Setting. We used data from the 2008 Health and Retirement Survey (HRS) supplemented by data from the 2006 Medical Expenditure Panel Survey (MEPS).

Study Design. We compared the simulated dental use and expenditures rates of newly insured persons against the corresponding rates for those previously insured.

Data Collection/Extraction Methods. The HRS is a nationally representative survey administered by the Institute for Social Research (ISR). The MEPS is a nationally representative household survey sponsored by the Agency for Healthcare Research and Quality (AHRQ).

Principal Findings. We found that expanding dental coverage to older uninsured Americans would close previous gaps in dental use and expense between uninsured and insured noninstitutionalized Americans 55 years and older.

Conclusions. Providing dental coverage to previously uninsured older adults would produce estimated monthly costs net of markups for administrative costs that comport closely to current market rates. Estimates also suggest that the total cost of providing dental coverage targeted specifically to nonusers of dental care may be less than similar costs for prior users.

Key Words. Dental utilization, insurance, coverage, retirement

Regular dental care is imperative in maintaining good oral health, for preventing dental disease, for diagnosing oral-related problems, and for identifying symptoms of other systemic conditions (IOM, 2011a). Unfortunately, many in the United States do not receive timely, adequate, or appropriate dental care. As a result, dental disease remains prevalent, especially among certain

vulnerable populations, with the Surgeon General noting in 2000 that dental disease is a "silent epidemic" among the poor and relatively young or old (DHHS, 2000). Notwithstanding the importance and seriousness of dental disease and its related symptoms, including pain and infection, the effects of dental disease are often not confined to the oral cavity (IOM 2011a,b; DHHS 2000) [1–3]. According to the Surgeon General's Report on Oral Health, "you cannot be healthy without oral health" and "oral health and general health should not be interpreted as separate entities" (DHHS 2000). More recently, the IOM Committee on an Oral Health Initiative reaffirmed that oral health is an integral part of overall health and suggested that "there is mounting evidence that oral health complications not only reflect general health conditions but also exacerbate them" (IOM 2011b). As our population ages, this connection may become increasingly problematic as a greater fraction of adults in the United States are retaining their teeth throughout their life (Douglass, Ostry, and Shih 1988; Burt 1992).

Having adequate dental insurance coverage is a key determinant of the decision to seek care and the ability to find a dentist willing to provide treatment (GAO 2000; Manski et al. 2004; Kaiser 2012; Vujicic and Nasseh 2013). Overall, 42 percent of adults 65 and older had a dental visit in 2011. Only 25 percent of those without dental coverage did, as compared with 57 percent of those with private dental coverage (Nasseh and Vujicic 2013a). In 2011 only 36 percent of community-dwelling individuals 65 and older in the United States were covered by private or public dental insurance, although such coverage may vary substantially in benefit generosity. Nearly two-thirds lacked dental coverage altogether (Nasseh and Vujicic 2013b). Private dental insurance is least common among individuals who are older, have lower incomes, less education, or are nonwhite (Manski and Brown 2004). The majority of individuals with private dental coverage obtain it through a private source, usually through an employer-sponsored plan. While an individ-

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ual may purchase a private pay plan, these plans tend to be quite expensive and particularly sensitive to adverse selection (AARP 2014a). In addition, while most adults age 65 years and over in the United States obtain their health insurance via Medicare, dental services have largely been excluded from Medicare except if it is performed during treatment needed for a concomitant health condition such as radiation treatment or kidney transplantation (DHHS 2010). As a result, in 2011, only 26 percent of those age 65 and older had private dental coverage, compared with 56 percent of younger adults ages 19–64 years (Nasseh and Vujicic 2013b).

Public dental coverage is also available through Medicaid and the Children's Health Insurance Program (CHIP) (CMS 2014). Public coverage for dental services varies by state; each is required to provide coverage for dental services for those under age 21, but the decision to cover adults is left to the states (Kaiser 2012). Historically, during difficult economic times, states have cut adult dental benefits (Pryor and Monopoli 2005). Indeed, in a recent letter addressing the fiscal difficulties faced by states, the Secretary of DHHS actually reminded states that dental benefits are optional in many cases (Sebelius 2011). Thus, the number of nonmandated individuals with dental coverage from Medicaid will probably decline in the near future as states attempt to balance their budgets. On the other hand, the Affordable Care Act (ACA) now requires insurance plans in the exchanges to include pediatric oral health services for children up to 21 years of age as an essential health benefit and expands Medicaid eligibility (CMS 2014). While the provisions within the ACA represent a substantial advancement in oral health, a key omission from the reform bill was any expansion of dental benefits to adults, adults with disabilities, or seniors. For some, this omission was a cost-saving necessity required to move the bill forward. For others, this was a once-in-a-generation lost opportunity to extend Medicare to dental and provide needed coverage to an underserved older American community.

The purpose of this paper is to empirically determine if insurance alone would close the current gaps in dental use and expenditures between insured and uninsured older Americans. We hypothesize that other characteristics associated with the demand for dental care are sufficiently different between the currently insured and uninsured older Americans that insurance coverage alone, although strongly correlated with the demand for dental services, would not be sufficient to close these gaps.

Methods

Data

For our study, we used data on the 17,217 individuals surveyed in the 2008 Health and Retirement Study (HRS) supplemented by a subset of older Americans from the 34,145 persons surveyed in the 2006 Medical Expenditure Panel Survey (MEPS). The HRS is a nationally representative longitudinal household survey administered by the Institute for Social Research (ISR) at the University of Michigan and sponsored by the National Institute on Aging. The HRS collects data every 2 years for individuals over age 50 and their spouses (RAND 2008; St. Clair, Blake, and Bugliari 2010). The MEPS is a nationally representative household survey sponsored by the Agency for Healthcare Research and Quality in the Department of Health and Human Services. The MEPS collects detailed information about medical and dental visits, insurance and expenditures, and payments as well as sociodemographic characteristics of the U.S. community-based population (Cohen 1997).

We restricted the HRS sample to persons who were 55 years and older with positive weights because of the relatively small sample of persons available in the HRS between the ages of 51 and 54 years. To correct for observations omitted because of missing data, we reweighted the sample by age and sex to Census estimates of the July 1, 2008, civilian, noninstitutionalized population (Census Bureau 2014a). For our final estimates, we reweighted our sample from 2008 to 2015 based on Census projections of expected changes in the resident population by age and sex between 2008 and 2015 (Census Bureau 2014b).

Simulation

The microsimulation technique we used for our study employed population projection and regression estimation techniques to assess and contrast the influence of having dental coverage on persons who are newly insured without use, persons who are newly insured with use, and persons who are previously insured with use. A graphical overview of our simulation approach is summarized in Figure 1. We (1) assign dental use probabilistically to persons previously without dental coverage and without dental use as well as their estimated third-party and out-of-pocket payments; (2) assign changes in out-of-pocket payments and third-party payments to persons previously without dental coverage and with dental use; and (3) assign third-party payments to all previously insured persons with dental use.

Figure 1:   Microsimulation Model Overview
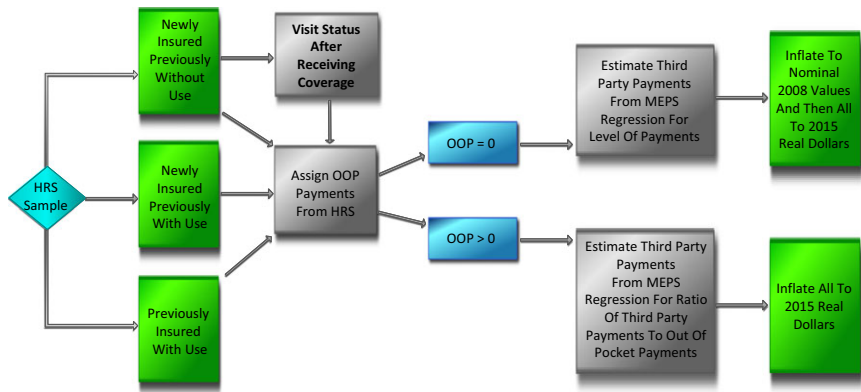
Dental Use. The first section of Figure 1 applies to newly insured older adults in the HRS without any previous dental use. These newly insured were probabilistically selected to have visited a dentist at least once from a logistic 2008 HRS regression equation for the likelihood of any dental use in the previous 2-year period. The HRS sample for this regression model included 14,188 persons after dropping those with zero weights or missing values. Independent variables included age, gender, race/ethnicity, education, marital status, region, and labor force and retirement status, family poverty status, type of dental coverage, health status and dentate status (all missing, not all missing), wealth status, and change in health status since the previous HRS wave.

Out-of-Pocket Payments. The second section of Figure 1 shows how we assign the postsimulation amounts of out-of-pocket payments for each of the three groups. Newly insured dental users were first probabilistically selected to either have OOP payments or not from a HRS logistic regression on a sample of dental users for the likelihood of having OOP payments >0. Those selected to have such payments were then assigned an amount from an HRS regression limited to persons with out-of-pocket payments >0.

      Those newly insured persons previously with use were assigned a change in out-of-pocket payments from separate HRS regressions for out-of-pocket payments by persons with dental use and for those with and without dental coverage. The predicted change was then added to the presimulation

self-payment. The total was set to zero if the change was less than zero and the unsigned change exceeded the former total.

Out-of-pocket payments for previously insured persons on the HRS were left unchanged.

Third-Party Payments. In Figure 1, we also show that the simulated amounts of third-party payments apply to all three groups. The method used to determine these payments depended on the size of out-of-pocket payments, 0 or >0. Because the HRS lacks data on third-party dental payments, we had to rely on data from the 2006 MEPS. Using a 2006 MEPS sample of 2,137 covered persons age 51 years and older we estimated two regression models for the simulation: (1) the log of third-party payments (TPP) for those with zero out-of-pocket payments (OOP); and (2) the log of the ratio of TPP to OPP for those with both payment sources. Explanatory variables in these models were the same as those in the HRS regressions except for the wealth and change in health status variables.

All those in the simulation in Figure 1 with OOP = 0 were assigned a 2006 value of third-party payments from the MEPS regression for those with zero out-of-pocket payments. Those with postsimulation OOP >0 in Figure 1 were assigned a predicted value of the ratio of TPP to OOP from the MEPS regression for this ratio. A 2008 value of third-party payments was then estimated as the product of the predicted ratio and the postsimulation 2008 OOP amount.

Payment Inflation. In the last section of Figure 1, we show that third-party dental payments estimated for those with zero OOP in the simulation in 2006 dollars were adjusted to 2008 nominal values by first doubling them to account for the additional year covered by the HRS sampling period (2 years vs. 1 year for the MEPS). Then these payments were further adjusted by 12.823 percent, representing a weighted average of changes between 2006 and 2008 in MEPS mean per capita dental expenditures for persons with expense in the 45–64 and 65+ age groups (AHRQ 2014a,b).

Lastly, in Figure 1, 2008 dental payments in the simulation were inflated to 2015 by 2.04 percent per year or by 18.05 percent in total over the 7-year period. This adjustment was based on a 4.43 percent annual average increase in the dental component of the Consumer Price index that was 2.04 percentage points in excess of the all items CPI over the 2000–2010 period (Census Bureau 2014c). Thus, our estimates represent 2015 real dollar values in terms of 2008 prices. We assumed that income and wealth increased at the rate of

inflation over this period so their real 2015 values in 2008 dollars remained unchanged over this period.

Type of Coverage. For the simulation, it was necessary to know whether persons were covered by public or private dental insurance. This information was missing for some previously covered persons in the HRS so we estimated a MEPS logistic regression for the likelihood of private dental coverage (vs. public coverage) for those with coverage to fill in the missing information.

For the newly insured in the simulation, we assigned older uncovered persons in households at or below 133 percent of the FPL to public dental coverage. All others on Medicare were assigned private dental coverage. Our reasoning was that should dental coverage ever be offered under Medicare, it would be purchased on the private market much the same as prescription coverage under Part D of Medicare. We left uncovered in the simulation those between 55 and 64 years not on Medicare with household incomes greater than 133 percent of the poverty line because they would not probably be targeted for coverage in the future under any policy extending dental coverage to older Americans.

The MEPS and HRS core sample designs are multistage area probability samples of households, so all estimates and statistics reported were computed taking into account this design with the use of the software packages *SUDAAN* and *STATA* (RTI 1995; Statacorp 2001). Because of the complexity in deriving standard errors for conditional expectation estimates for individual observations from numerous regressions, we did not provide estimates of statistical significance for our simulation results.

RESULTS

Full Population

Expanding dental insurance to previously uninsured noninstitutionalized older Americans is estimated to increase the percent of the projected 2015 population of 85.4 million persons 55 and older with a dental expense during the previous 2-year period by nearly 10 percentage points, from 65.3 to 74.2 percent (Table 1). Total dental expenditures for this age group would increase by $32.8 billion or by nearly 30 percent from $114.2 billion to $147.0 billion over this 2-year period. Third-party payments are estimated to increase by 71 percent or by $36.1 billion, from $50.9 billion to $87.1 billion, with an additional $28.3 billion for private coverage and $7.8 billion for public coverage.

Table 1:   Simulated* Impact of Dental Coverage

	Total	Insured			Uninsured
		Total	Public	Private	
Population (1,000's)	85,369	74,538 [41,322]	15,876 [8,659]	58,662 [32,663]	10,831 [44,047]
Percent with dental expense	74.2 [65.3]	76.6 [76.5]	58.8 [58.2]	81.4 [81.4]	57.7 [54.7]
Total dental expense ($millions)	146,975 [114,161]	137,370 [76,412]	21,000 [10,675]	116,370 [65,737]	9,604 [37,749]
Third-party payments ($millions)	87,056 [50,933]	87,056 [50,933]	15,372 [7,547]	71,684 [43,386]	0 [0]
Out-of-pocket payments ($millions)	59,918 [63,228]	50,314 [25,479]	5,628 [3,128]	44,686 [22,351]	9,604 [37,749]
Mean expense per person with expense	2,321 [2,049]	2,398 [2,399]	2,252 [2,118]	2,438 [2,473]	1,537 [1,566]
% Third-party payments	59.3 [44.5]	63.4 [66.7]	73.2 [70.7]	61.6 [66.0]	0 [0]
% Out-of-pocket payments	40.8 [55.6]	36.6 [33.3]	26.8 [29.3]	38.4 [34.0]	100 [100]

*Simulated Impact on Dental Expense, Payments and Coverage for Americans 55 and Older by Dental Insurance Status after Expanding Coverage to the Uninsured, 2-year Estimates (2013–2015) [Presimulation Values in Brackets] Based on a sample of 14,188 persons from the 2008 HRS who were 55 and older, with positive-valued weights, and without any missing data. The sample was calibrated to Census estimates of the civilian, noninstitutionalized population as of July 2008 by age and sex [23], and then projected to 2015 based on Census projections of the resident population of the United States between 2008 and 2015 by age and sex [24]. Dental expenses in 2015 are in real 2008 dollar values. See the Methods section above. The all items CPI-U increased at an annual average rate of 1.023% between July 2008 and July 2012 (Bureau of Labor Statistics 2012). Extrapolating this rate to July 2015 converts real 2015 dollars in our tables to nominal 2015 values by a factor of 1.073846 or by almost 7.4%. Rounding accounts for any sums not equal to totals.

Out-of-pocket payments would decline by only 5 percent or by $3.3 billion from $63.2 billion to $59.9 billion. Mean dental expense for those with an expense would increase by about 13 percent, from $2,049 to $2,321. The proportion of dental expense covered by third-party payments increased in the simulation by 15 percentage points while offsetting an equivalent percentage point decline in the proportion paid out of pocket.

Newly Insured

The results in Table 1 show an increase in the overall demand for dental services from providing dental coverage to over 33 million persons 55 years and older. Table 2 results for the newly insured enable us to analyze the extent of gaps in dental use and expenditure for the uninsured closed by simulated coverage. Prior to the simulation, over half of the uninsured (54.7 percent) used dental services in the previous 2 years compared to 76.5 percent of the insured (Table 1). However, simulated coverage induced enough of the uninsured previously without use to become users and bolster the overall use rate for this group to 77.5 percent, a percentage point higher than that of the insured population prior to the simulation (Table 2). As a result, the dental use rate for the full population from Table 1 is estimated to increase from 65.3 to 74.2 percent in the simulation.

The newly insured prior to the simulation had a disproportionately low amount of total dental expenditure; their share of $28.1 billion represented 25 percent of the total, yet they represented 39 percent of the population. After becoming insured in the simulation, their total dental expenditure increased to $61.0 billion or an approximate proportional 41 percent amount of the total. The reason this gap was closed is attributed to the demand for services induced by insurance coverage. Had there been no additional simulated demand for dental services, total dental expense for all those 55 years and older would have remained at the $114.2 billion presimulation level in Table 1. With no simulated change in dental expenses, the newly insured would have continued to spend only $28.1 billion on dental care, but only 41 percent or $11.5 billion of this $28.1 billion out of pocket with coverage instead of the entire amount. However, insurance coverage induced an additional $32.8 billion in dental expenses by the newly insured over and above the $28.1 billion spent prior to becoming insured. This induced demand for dental care nullified most of the reduction in out-of-pocket payments otherwise experienced by the newly insured. After the simulation, they still paid $24.835 billion out of pocket (the increase in OOP payments by the insured from Table 1), only $3.3 billion or about 12 percent less than the $28.1 billion before become covered.

Table 2:   Simulated* Impact on Newly Insured

	Total†	Public Dental Insurance		Private Dental Insurance	
		No Presimulation Dental Use	*Presimulation Dental Use*	*No Presimulation Dental Use*	*Presimulation Dental Use*
Population (1,000's)	33,306	4,788	2,429	10,236	15,763
Percent with dental use	77.5 [54.6]	40.2 [0]	100 [100]	55.3 [0]	100 [100]
Total dental expenditure ($millions)	60,959 [28,145]	1,684 [0]	8,641 [2,934]	3,987 [0]	46,647 [25,211]
Mean dental expense per person with expense ($)	2,036 [845]	875 [0]	3,664 [1,208]	705 [0]	3,009 [1,599]
Mean third-party payment per person with expense ($)	1,254 [0]	772 [0]	2,917 [0]	460 [0]	1,664 [0]
Mean out-of-pocket payment per person with expense($)	799 [845]	103 [0]	978 [1,208]	245 [0]	1,345 [1,599]

*Simulated Impact of Dental Insurance on Newly Insured Americans 55 and Older by Type of Coverage and Presimulation Dental Use, 2-year Estimates (2013–2015) [Presimulation Values in Brackets]. Based on a sample of 14,188 persons from the 2008 HRS who were 55 and older, with positive-valued weights, and without any missing data. The sample was calibrated to Census estimates of the civilian, noninstitutionalized population as of July 2008 by age and sex [23] and then projected to 2015 based on Census projections of the resident population of the U.S. between 2008 and 2015 by age and sex [24]. Dental expenses in 2015 are in real 2008 dollar values. See the Methods section above. The all items CPI-U increased at an annual average rate of 1.023% between July 2008 and July 2012 (Bureau of Labor Statistics 2012). Extrapolating this rate to July 2015 converts real 2015 dollars in our tables to nominal 2015 values by a factor of 1.073846 or by almost 7.4%. Rounding accounts for any sums not equal to totals.
†Any differences between values in this column from estimates in the text derived from Table 1 are due to rounding.

Population Characteristics

Table 3 shows the simulation results by various population characteristics for the entire 2015 U.S. population of 85.4 million civilian, noninstitutionalized persons age 55 years and older. As in Table 1, postsimulation estimates are shown as well as the bracketed presimulation estimates.

Percent with Expense. Based on changes in the percent of the population with expense, the simulation has the strongest relative impact on higher age groups; non-Whites; middle and lower income households; those in fair/poor health; least wealthy households; retirees and nonretirees not in the labor force; noncollege graduates; and never-married individuals. For example, the percent of those with dental expense during the 2-year period increased by only 4 percentage points for those 55–64 years of age (from 69 to 73 percent), but increased by about 18 percentage points for those 85 years and older (from 54 to 72 percent). The percent with dental expense increased by only 5 percentage points for those in higher income households, but increased by between 11 (persons in middle-income households) and 16 (persons in poor households) percentage points for those in lower income households. There were no notable differences in relative impacts of the simulation according to this measure by gender or region of the country.

Public Payments. Based on changes in the percent of dental expenses paid by public insurance, the simulation targeted those with incomes under 133 percent of the poverty line and had the largest relative impact, apart from household income, on persons in the lowest and highest age groups; Hispanics and Black non-Hispanics; in fair/poor health; in the least wealthy households; those not retired and not in the labor force; high school graduates; and not married individuals. Public payments increased by about 10 percentage points for Hispanics and non-Hispanic Blacks to equal about one-fifth and one quarter of all 2-year dental expenses for these two groups, respectively, after the simulation. The increases were even more dramatic, as expected, for individuals in poor and low-income households. Once again, there were no distinct differences in public payments by gender or region of the country.

Private Payments. Based on changes in the percentage of dental expenses paid by private coverage, the simulation targeted at persons living in households with incomes in excess of 133 percent of the poverty threshold had the biggest relative impact on those over 65 years; in low- or middle-income households; not in the least wealthy households; not classified as not retired, in the labor force; and persons classified as high school graduates. Private payments covered only about 10–23 percent of 2013–2015 dental expenditures for those 65 years and over prior to the simulation. After the simulation, private

Table 3:   Simulated* Impact by Population Characteristic

Population Characteristic	Population (1,000's)	Percent with Expense	Mean per Person with Expense	Total Expense ($ millions)	Source of Payment (%)		
					Out of Pocket	Public	Private
Total	85,369	74.2 [65.3]	2,321 [2,049]	146,975 [114,161]	40.8 [55.6]	10.5 [6.5]	48.8 [38.0]
Age in years							
55–64	40,334	72.8 [69.3]	2,425 [2,325]	71,239 [64,982]	38.4 [42.4]	9.2 [3.8]	52.4 [53.8]
65–69	15,681	77.1 [65.4]	2,626 [2,019]	31,745 [20,713]	40.6 [67.03]	10.0 [10.0]	49.4 [22.9]
70–74	10,966	75.3 [61.9]	2,034 [1,703]	16,799 [11,554]	47.3 [73.1]	12.4 [11.8]	40.3 [15.1]
75–79	7,632	74.9 [61.9]	1,864 [1,569]	10,659 [7,410]	48.7 [79.0]	11.2 [11.2]	40.0 [9.8]
80–84	5,331	74.7 [57.8]	2,127 [1,574]	8,465 [4,853]	40.2 [80.7]	11.4 [8.4]	48.3 [10.9]
85 and older	5,425	71.6 [53.8]	2,076 [1,593]	8,068 [4,649]	39.4 [79.2]	17.0 [8.1]	43.5 [12.7]
Gender							
Male	39,432	72.6 [63.9]	2,293 [2,054]	65,689 [51,754]	39.9 [53.0]	10.2 [7.1]	49.9 [39.9]
Female	45,937	75.5 [66.4]	2,345 [2,045]	81,286 [62,407]	41.5 [57.8]	10.6 [6.0]	47.8 [36.2]
Race/Ethnicity							
Black, non-Hispanic	7,563	54.3 [45.1]	1,864 [1,650]	7,651 [5,634]	32.4 [46.0]	24.7 [15.9]	42.9 [38.1]
Hispanic	5,689	63.3 [50.1]	2,430 [2,053]	8,745 [5,854]	37.9 [54.9]	21.6 [10.6]	40.4 [34.5]
White non-Hispanic	70,104	77.3 [68.9]	2,347 [2,069]	127,178 [99,876]	41.5 [56.3]	8.8 [5.7]	49.7 [38.0]
Other	2,013	70.3 [58.7]	2,404 [2,366]	3,401 [2,797]	40.3 [52.3]	11.7 [7.2]	47.9 [40.5]
Poverty status[†]							
Poor	7,144	54.4 [38.5]	2,112 [1,366]	8,214 [3,756]	24.2 [58.7]	64.5 [16.9]	11.3 [24.4]
Low income	13,329	62.5 [47.3]	1,950 [1,524]	16,257 [9,619]	38.5 [73.4]	24.9 [9.0]	36.6 [17.6]
Middle income	24,646	70.6 [59.9]	2,025 [1,742]	35,250 [25,725]	43.0 [63.2]	5.0 [6.7]	51.9 [30.1]
High income	40,250	83.7 [79.2]	2,591 [2,353]	87,254 [75,062]	41.8 [50.4]	4.9 [5.6]	53.3 [44.0]
Region							
Northeast	14,319	77.8 [67.9]	2,314 [2,150]	25,775 [20,909]	44.8 [59.0]	8.8 [6.4]	46.4 [34.5]
Midwest	22,282	79.0 [71.1]	2,002 [1,734]	35,255 [27,455]	38.2 [52.8]	7.8 [3.6]	54.0 [43.6]
South	16,615	78.0 [71.0]	2,722 [2,438]	35,288 [28,757]	46.1 [59.2]	11.1 [8.1]	42.8 [32.8]
West	32,153	67.2 [57.1]	2,345 [2,017]	50,657 [37,040]	36.9 [53.0]	12.7 [7.6]	50.4 [39.4]
Health status							
Fair/poor	23,215	60.3 [46.8]	2,413 [2,126]	33,773 [23,092]	38.4 [59.6]	17.1 [8.8]	44.5 [31.6]
Good	27,053	75.7 [66.7]	2,110 [1,891]	43,207 [34,101]	44.1 [59.3]	9.0 [5.0]	46.9 [35.8]

Table 3. *Continued*

Population Characteristic	Population (1,000s)	Percent with Expense	Mean per Person with Expense	Total Expense ($ millions)	Source of Payment (%)		
					Out of Pocket	Public	Private
Very good/excellent	35,101	82.2 [76.4]	2,427 [2,124]	69,995 [56,968]	39.9 [51.8]	8.2 [6.5]	51.9 [41.7]
Wealth status							
1–3	24,146	54.1 [42.3]	1,767 [1,581]	23,065 [16,139]	35.8 [51.6]	21.8 [10.8]	42.4 [37.5]
4–6	25,748	73.1 [63.7]	2,251 [2,011]	42,374 [32,978]	38.2 [51.3]	8.9 [5.1]	52.9 [43.6]
7–9	26,747	87.4 [80.5]	2,490 [2,165]	58,228 [46,592]	42.4 [57.0]	8.7 [6.1]	48.9 [37.0]
10	8,728	92.2 [87.0]	2,898 [2,428]	23,308 [18,452]	46.3 [63.5]	6.6 [6.5]	47.1 [30.0]
Retirement status							
Fully retired	40,600	73.2 [60.4]	2,069 [1,716]	61,474 [42,102]	43.1 [69.5]	13.1 [8.8]	43.8 [21.7]
Partly retired	9,396	77.4 [69.9]	2,524 [2,211]	18,358 [14,520]	42.6 [56.1]	10.0 [8.3]	47.4 [35.5]
Not retired, in the labor force	26,822	76.7 [74.3]	2,539 [2,416]	52,217 [48,162]	40.3 [44.0]	4.2 [2.5]	55.5 [53.5]
Not retired, not in the labor force	8,551	67.3 [54.8]	2,592 [1,999]	14,926 [9,376]	30.7 [51.6]	22.1 [13.8]	47.3 [34.5]
Education							
Some or no school	50,002	73.8 [65.3]	2,284 [2,003]	84,247 [65,412]	40.9 [56.2]	10.1 [6.1]	49.0 [37.7]
High school graduate	14,319	53.2 [35.2]	1,711 [1,403]	13,025 [7,081]	33.5 [63.1]	23.1 [12.6]	43.4 [24.4]
College graduate	21,048	89.4 [85.6]	2,643 [2,312]	49,703 [41,668]	42.5 [53.4]	7.7 [6.1]	49.7 [40.5]
Marital status							
Widowed, divorced	3,464	72.2 [65.9]	2,026 [1,686]	5,065 [3,847]	40.8 [57.3]	19.2 [12.6]	40.0 [30.1]
Never married	27,909	68.0 [55.5]	2,233 [1,881]	42,381 [29,118]	38.1 [60.5]	16.5 [7.8]	45.3 [31.7]
Married	53,996	77.5 [70.3]	2,380 [2,139]	99,530 [81,195]	41.9 [53.7]	7.4 [5.8]	50.7 [40.5]

*Pre- and Postsimulation Dental Expense and Payment Sources by Population Characteristics, Civilian, Noninstitutionalized Persons 55 and Older, U.S., 2013–2015: Presimulation Results in Brackets [Dental Expense in Real $2008) Based on a sample of 14,188 persons from the 2008 HRS who were 55 and older, with positive-valued weights, and without any missing data. The sample was calibrated to Census estimates of the civilian, noninstitutionalized population as of July 2008 by age and sex [23] and then projected to 2015 based on Census projections of the resident population of the United States between 2008 and 2015 by age and sex [24]. The all items CPI-U increased at an annual average rate of 1.023% between July 2008 and July 2012 (Bureau of Labor Statistics 2012). Extrapolating this rate to July 2015 converts 2015 expenses in real 2008 dollars in our tables to nominal 2015 values by a factor of 1.073846 or by almost 7.4%. See the Methods section above. Rounding accounts for any sums not equal to totals. Wealth status categories represent household wealth deciles from lowest (1-3) to highest (10).

†Low income refers to persons in families with incomes 101% to 200% of the poverty line; middle income, 201% to 400% of the poverty line; and high income >400% of the poverty line. Poor persons were at or <100% of the poverty line, including persons in families with negative income.

payments accounted for between 40 and 49 percent of dental expenses for persons in this age group. Older Americans living in middle-income households saw their private payments increase from 30 to 52 percent of their dental expenses. Those fully retired had 44 percent of their dental bills covered by private insurance payments, double the percentage covered by private payments prior to the simulation. By this measure, there were no notable relative impacts of the simulation by gender, race, region, health status, or marital status.

DISCUSSION

In this study, we simulated the impact on dental utilization and expenditures of expanding dental insurance to a large portion of uninsured older Americans 55 years and older. We found that an expansion of dental coverage in 2015 to over 33 million of these older uninsured Americans would close previous gaps in dental use and expense between uninsured and insured noninstitutionalized Americans 55 and older. Despite these results, we still found that 15 million of the previously uninsured without dental use (or 45 percent of all previously uninsured in our population) were estimated to have dental use rates (40 and 55 percent) and mean expenditures ($875 and $705) far below those of the previously insured (76.5 percent and $2,399 respectively) after becoming insured. These findings are not surprising given the lower income, wealth, and educational levels, the worse health, and the higher age groups of the uninsured compared to the insured.

Our results demonstrate increased demand for dental services should a large portion of uninsured older Americans become covered, a result consistent with a recent study of expanded Medicaid dental benefits to adults ages 19–64 years in Massachusetts. The study showed a 11-percentage-point increase in dental use for poor Massachusetts' adults over and above the increase for nonpoor adults after the reform, a magnitude of increase comparable to our simulation findings for an uninsured older adult population (Nasseh and Vujicic 2013c).

We cannot say for certain that the currently uninsured would take up insurance if it were provided, would find sufficient providers to service demand or would pattern their demand for dental services with coverage similar to those currently with coverage. There could be underestimation due to pent-up demand by the uninsured for expensive services from their lack of preventive care that our simulation, based on cross-sectional regression

estimates, could not capture. There could also be other unmeasured intangibles such as fear or anxiety that could cause overestimation. There is also the issue of adverse selection into coverage by the insured most in need of dental care, or cherry-picking policyholders by insurers, that could bias estimated insurance coefficients upward or downward, respectively. Although this issue is often ignored, efforts to address it using instrumental variable or other approaches have had mixed results (Sintonen and Linnosmaa 2000; Munkin and Trivedi 2009; IOM 2011a; Cooper, Manski, and Pepper 2012; Meyerhoefer, Zuvekas, and Manski 2014). Our own instrumental variable estimates provided a weak test of exogeneity, but as with other researchers, we struggled to find credible instruments. Nevertheless, our simulation provides important information for policy planners who might contemplate providing dental coverage to the uninsured.

Our estimates of increased demand for dental care suggest that the monthly premium, apart from mark-ups including administrative costs, for a private plan with an average generosity consistent with that which is available in the employed group market would be about $45 per month (see Table 4). This amount comports well and falls within the range of the two plans currently offered to seniors by AARP/Delta Dental whose offering included a Plan A with a price of $57.19 per month and Plan B with a price of $40.48 per month for one person residing in the Baltimore Maryland area during February 2013 (AARP 2014a). The AARP/Delta Dental plans are indemnity programs with reimbursement rates on a par with employed group market plans or slightly below (AARP 2014b). Our estimates also suggest that the monthly cost, apart from mark-ups including administrative costs, for a public plan with an average generosity consistent with that which is available in the employed group market would also be about $45 per month (see Table 4).

Maryland is but one of a handful of states that has agreed to establish an exchange and expand Medicaid under the ACA. While states are required to

Table 4:   Simulated Estimate of Average Monthly Third-Party Payment by Type of Coverage for Newly Covered Americans 55 Years and Older (2015 Estimates in Real 2008 Dollars)

	Total Population	*Total Amount*	*Amount Per Two Year Period*	*Amount Per Year*	*Amount Per Month*
Private	25,999,000	$28,298,000,000.00	$1,088.43	$544.21	$45.35
Public	7,217,000	$7,825,000,000.00	$1,084.25	$542.12	$45.18

provide dental benefits to children covered by Medicaid and the CHIP, they are not required to do so for adults (CMS 2014). Maryland does not currently provide dental benefits to adults with Medicaid, and no plan to do so in the near future is currently being discussed. However, if policy planners do contemplate adding this coverage based on our simulation, we estimate that the total cost for providing this coverage could be somewhat less than our estimates show. Recall that our regression estimates of dental expenditures for persons with public coverage are not restricted to only Medicaid recipients. In fact, we discussed previously the lack of Medicaid coverage for adults at all age groups. Table 3 shows that conditional mean dental expense is about 25 percent lower for lower and middle-income older adults than higher income older adults, and 28–64 percent lower for persons in the lowest household wealth class compared to those in the higher wealth classes. As such, our estimates of premiums for public programs in Table 4 are likely biased upwards, so that the actual costs of expanding coverage under Medicaid are likely to be lower than expected based on our results.

Interestingly, although not required, several current Maryland Health Choice Managed Care Organizations (MCO) do offer very limited dental services for adults including an oral examination, cleanings, limited x-rays, and discounted fees (20 percent reduction) (MDHMH 2000). Our simulation suggests that depending upon the design and generosity of coverage, these services could be expanded in scope and number at market or less than market cost, particularly if cost sharing is provided to limit the additional demand induced, especially by those previously uninsured using dental services. It is also possible that one of the Maryland Health Connection Plan Exchange providers may reasonably contemplate adding dental coverage for adults as an enticement to draw clients to their plan. Each is already providing dental coverage for pregnant adults and children under age 21 as a required Essential Health Benefit. The administrative cost to extend this coverage to adults or older adults would be minimal. Carriers would have wide latitude in designing a dental extension in terms of generosity and price. Given the ability to leverage an existing administrative infrastructure to provide this benefit, it is possible that a plan could be designed to be lower in cost and more profitable than the plan currently being offered by AARP. Plans could be limited in scope as with the current MCO offerings, take advantage of the buying power of large groups providing substantial discounts, limited to prevention, or designed to include sufficient cost sharing to keep premiums low.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

Appendix SA1: Author Matrix.